

REVISION OF
THE FLORA OF THE BOMBAY PRESIDENCY.

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PART XX.

(With 2 plates).

(Continued from page 28 of this volume).

BALSAMINACEAE

(Cke. under *Geraniaceae*).

IMPATIENS Linn.

Species about 350.—Tropical and N. temperate regions, especially mountains of India and Ceylon.

The Balsams (*Impatiens*) form one of the most perplexing groups of the Indian flora. J. D. Hooker himself was not satisfied with the results he had obtained from the Herbarium specimens upon which he had worked for the Flora of British India. 'The species were very often only to be distinguished by very delicate differences in the shape of the flowers and the relations of their parts, which were too often masked or crushed in the dried specimens. All his inexhaustible patience was needed in the tedious work of soaking the crumpled specimens from the paper to which they were heavily glued, and getting them into shape for drawing and examination under the microscope.'¹

He began re-examining *Impatiens* in 1898. In one form or another this continued to be his principal occupation during the last ten years of his life. In the beginning he found classification difficult. 'I must confess,' he writes to Duthie in October 1898, 'that the outlook is far from reassuring, and I quail before it.'

The capsule offered the best primary division, but fruiting specimens were often absent, and in other cases the fruit appeared not to burst elastically with resilient valves. He then attempted to make use of the lip for classification, the saccate form in contradistinction to the funnel-shaped, at the same time making use of the sepals and the bracts. But all this did not overcome the worst difficulty. 'Without the wings,' he says, 'I am all at sea and the attempt to ascertain their forms is heart-breaking.' Here were many practical difficulties. It was impossible to ascertain the structure on dried flowers until they were moistened and dissected. 'I need not say that this is a most laborious process and one destructive of specimens, owing to the extreme delicacy of the tissues, the shocking state of the specimens in so many cases; owing too to the grievous carelessness with which the specimens are glued down, it often takes an hour to get out the flower from under the leaves; and two or even four to dissect it.'

In 1903 Hooker wrote to Gamble: 'I must now go to *Impatiens* which really terrifies me. I cannot get good groups, and they keep me awake.' When he had overcome the first systematic difficulties, he discovered that to complete his descriptions he had to examine most of the species afresh, and even then the descriptions were 'vague and loose', for 'every organ is variable except such as afford no character at all: it is like making species out of the waves of the sea.'

When he had to reject other botanists' identifications among the Balsams, as in Duthie's paper in the Records on Chitral plants, he confesses in 1909: 'I take to myself the blame, for you had nothing but the Fl. Brit. Ind. to refer to, and that is utterly unsatisfactory, full of imperfections and errors. In fact, it was not till after the publication of Vol. I of that work that I essayed a critical study of the Indian species by moistening and analysing every specimen where there could be any doubt. The consequent labour has

¹ Leonard Huxley: *Life and Letters of Sir Joseph Dalton Hooker*. London, 1918, ii, 377.

been trying, for within my experience no genus of Phanerogams approaches *Impatiens* in difficulty of analysis, description and classification of species. Except by geographical areas it is impossible to bring the species under control, any attempt to bring all under one classification as in Fl. Brit. Ind. ends in chaos.'

In spite of all the difficulties Hooker was able to finish his 'Epitome of the British Indian Species of *Impatiens*' in 1905, and it was published in 1906 in the Records of the Botanical Survey of India. To this he was able to add: 'On some Species of *Impatiens* from Indo-China and the Malayan Peninsula' (Kew Bull. 1909), and 'Indian Species of *Impatiens*' (Kew Bull. 1910).

The classification of species in the Epitome is widely different from that adopted in the Fl. Brit. Ind. Two reasons are assigned for this: 1. The number of new species described since the publication of the Flora and better materials of other species which has required a re-examination of the old sections. 2. The restriction of the vast majority of the species of *Impatiens* to its own area of distribution (E. Himalaya, W. Himalaya, Burma, Malabar, Ceylon, Malay Peninsula).

Future collectors may find the following note by Hooker of use: 'The points upon which most information, as not being obtainable from Herbarium specimens of *Impatiens*, is wanted, are the duration and habit of the species, the presence or absence of raphides in the leaves and floral organs. The colours of the flowers, with drawings if procurable, the nature and function of a dilation on the opposing margins of the wings which occurs nearly opposite the sinus between the lobes of the wings; this, which is often absent, may be produced into an ear-shaped lobule or into a thread descending into the spur: I have called it the dorsal auricle of the wings. The anther varies greatly in the genus and can rarely be described from Herbarium specimens. The fruits and seeds of many species are unknown, and, owing to the testa of the latter shrinking in drying, these should be described from fresh specimens. Pollination by insects is a very interesting process, which should be watched and described.'

'In forming Herbarium specimens these should be laid in the sheets of a portfolio in the field, with spare flowers and with separate floral organs laid beside them. It is not recommended to preserve flowers in alcohol, which renders them very brittle.'

Cooke published *Impatiens* in 1901, 5 years before the appearance of Hooker's Epitome. He mentions 16 species. His *I. rivalis* Wight will be called *I. scapiflora* Heyne and *I. inconspicua* Benth. must cede to *I. pusilla* Heyne. To Cooke's 16 species we add 4 more: *I. kleiniformis* Sedgwick, *I. diversifolia* Wight., *I. Talboti* Hook. f. and *I. rupicola* Hook. f.

Key mainly after Hook. f.

- I. *Scapigeræ*.—Rootstock tuberous; leaves all radical; scape radical; flowers racemose; seeds very minute, clothed with spiral hairs
- | | | | |
|-------------------------------------|-----|-----|---------------------------|
| 1. Lip with very long incurved spur | | | |
| a. Wings 2-lobed | ... | ... | 1. <i>I. acaulis</i> . |
| b. Wings 3-lobed | ... | ... | 2. <i>I. scapiflora</i> . |
| 2. Lip with a short spur | ... | ... | 3. <i>I. Beddomei</i> . |
| 3. Lip spurless | ... | ... | 4. <i>I. Stocksii</i> . |
- II. Annual herbs
- | | | | |
|---|-----|-----|-----------------------------|
| 1. Sepals linear or linear-lanceolate; seeds black and shining | | | |
| a. Spur of lip slender, longer than the wings or shorter | | | |
| * Stem stiff usually simple, leaves broad or narrow, coriaceous, serrate | ... | ... | 5. <i>I. chinensis</i> . |
| ** Stem slender simple or sparingly branched, leaves submembranous entire or subserrate | ... | ... | 6. <i>I. rupicola</i> . |
| *** Stem flaccid usually branched, leaves broad or narrow subentire | | | 7. <i>I. diversifolia</i> . |



A formation of *Impatiens acaulis* Arn. on vertical rocks.



Impatiens pusilla Heyne.

Photos by C. McCann.

- **** Stem slender flaccid; wings long stipitate, no lines of pubescence on pedicels ... 8. *I. Kleinii*.
- ***** Stem slender flaccid; lines of pubescence on pedicels ... 9. *I. kleiniformis*.
- b. Spur or lip very short or 0
- * Lip scapiform or cymbiform
- † Flowers very small, spur of lip very minute or 0 ... 10. *I. pusilla*.
- †† Flowers medium sized, yellow, standard winged, spur of lip minute or 0 ... 11. *I. Lawii*.
- ** Lip saccate, spur of lip very short
- † Glabrous, flowers very small, lip shortly saccate ... 12. *I. oppositifolia*.
- †† More or less pubescent, flowers medium sized, lip deeply saccate ... 13. *I. tomentosa*.
2. Sepals ovate or ovate-lanceolate, seeds various
- Leaves opposite, 5-12.5 cm. long ... 14. *I. Dalzellii*.
- III. *Microsepalae*.—Shrubs and herbs; leaves opposite, alternate and rarely whorled; flowers pedicelled; pedicels solitary, binate or fascicled in the axils of the leaves (peduncle 0); sepals small or minute; seeds smooth, rugose or papillose
1. Leaves opposite alternate and whorled on the same plant, seeds obovoid, rugose or papillose
- a. Shrubs; basal lobe of wings smaller than the distal, spur of lip short, incurved; leaves 5-10 cm. long, petiole long ... 15. *I. latifolia*.
- b. Herb, annual, lobes of wings subequal, spur of lip very slender ... 16. *I. lucida*.
2. Leaves all alternate
- a. Capsule pilose or tomentose
- * Lip spurred, seeds globose, smooth ... 17. *I. balsamina*.
- ** Lip spurless, seeds minute, granulate ... 18. *I. scabriuscula*.
- b. Capsule glabrous, seeds glabrous, rugose, spur of lip long
- * Flowers large ... 19. *I. pulcherrima*.
- ** Flowers small ... 20. *I. Talboti*.

1. ***Impatiens acaulis*** Arn. in Hook. Comp. Bot. Mag. I (1835) 325; Dalz. & Gibs. Bomb. Fl. 42.—*I. scapiflora* Hook. in Bot. Mag. 64 (1837) t. 3587 (*non* Heyne).

We found white flowers on the Fitzgerald Ghat.

The seeds in this species are minute and yellowish brown. They are armed with minute hooks which probably help in fastening them to the perpendicular rocks on which these plants grow.

Locality: *W. Ghats*: Khandala (Woodrow !, Hallberg !, McCann !); Lonavla (Woodrow !); Mahableshtar (Cooke !); Fitzgerald Ghat (Cooke !, McCann !, Blatter !, Fernandez !).—*Konkan*: Hills of Konkan (Stocks); Matheran (Birdwood).

This species grows on rocks in such places where water trickles down. The plants dry down during the dry months but the rootstocks remain adhering to the rocks and sprout again with the next rains.

Distribution: From the Konkan to Travancore, ascending to 7,000 ft. in the Nilgiris, Ceylon.

2. **Impatiens scapiflora** Heyne in Roxb. Fl. Ind. ed. Carey II, 464; Gamble Fl. Madras (1915) 138.—*I. rivalis* Wight in Madras Journ. 13, t. 8; Ic. t. 751; Dalz. & Gibs. Bomb. Fl. 42; Hook. f. Fl. Brit. Ind. I (1874) 444; Cke. I (1901) 170.—*I. verrucosa* Bedd. in Madras Journ. IV, 69, t. 7, f. 9.

Locality: Konkan: (Stocks).—W. Ghats: Ramghat (Dalzell): usually on dripping rocks.

Distribution: From S. Kanara to Travancore, from 6,000-8,000 ft.

3. **Impatiens Beddomei** Hook. f. Fl. Brit. Ind. I (1874) 472; Cke. I (1901) 169.—*I. scapiflora* Wight & Arn. Prodr. 137; Wight Ic. t. 967; Graham Cat. 34 (non Heyne).

According to Gamble (p. 138) the flowers are white with yellow patches on the wings.

Distribution: Bombay Konkan, W. Ghats at 6,000-8,000 ft. in the Nilgiris, on the downs.

4. **Impatiens Stocksii** Hook. f. & Th. in Journ. Linn. Soc. 4 (1860) 119; Dalz. & Gibs. Bomb. Fl. 42; Cke. I (1901) 170.

Distribution: Bombay Konkan.

5. **Impatiens chinensis** Linn. Sp. Pl. (1753) 937; Cke. I (1901) 171.—*I. fasciculata* Lam. Encycl. I, 363; Wight Ic. t. 748.

Distribution: Konkan and Kanara of Bombay Presidency, E. Ghats at 5,000 ft., W. Ghats of Madras Presidency, in all districts at 5,000-8,000 ft., Bhutan, Khasia Mts., Burma, Tenasserim, (not in Malay Peninsula !), China.

6. **Impatiens rupicola** Hook. f. in Kew Bull. (1910) 292.

Description: A herb, 30-40 cm. high, erect, almost glabrous, small-flowered; stem slender, simple or sparingly branched; internodes elongate. Leaves opposite, sessile or very shortly petiolate, 3-8 cm. long, submembranous, oblong, obovate-oblong or linear, acute, quite entire or subserrate, rotund at the base, cordate or acute, nerves obscure; infrapetiole glands subulate or 0. Inflorescence simply pedicellate; pedicels solitary or 2 together, very slender, 3-4 cm. long, glabrous or puberulous, spreading or in fruit deflexed. Flowers 1.5-2 cm. when expanded, rose or rose-purple, raphides 0. Sepals 2, linear, acuminate, 7-10 mm. long, 3-nerved, glabrous, rarely pilose. Vexillum orbicular, cucullate, 8-10 mm. diam., midvein keeled on the back, keel mucronate, gibbous at the lower end. Wings broadly stipitate, 1.2-1.5 cm. long; basal lobe small, trigonous, erect, distal lobe much larger, stipitate, orbicular or obovate; dorsal auricle rotund, prorect or decurved. Limb of labellum deeply cymbiform, ascending mouth obtuse, apiculate, spur very small, incurved. Filaments subulate; anthers connate, decurved. Ovary straight, acute at the apex and incurved. Capsule ellipsoid, shortly stipitate, long and acutely rostrate, 12-15 mm. long, many-seeded. Seeds orbicular, compressed, 2-2.5 mm. diam., smooth, black or chestnut brown, shining.

This species is nearly related to *I. chinensis*, but can be distinguished by the entire leaves, by the flowers and capsules being much smaller and by the very small spur of the lip. Hooker himself thinks that *I. rupicola* may prove to be a 'small flowered and fruited, almost spurless state of *I. chinensis*, which it seems to represent in the Western Ghats from the latitude of Goa to that of Poona.'

Locality: W. Ghats: Khandala, 2,000 ft. (Meebold 8813); Belgaum, N. Hills (Ritchie 120); Castle Rock, 2,000 ft. (Meebold 10719).—N. Kanara (Talbot 2514).

Flowers: September 1891 (N. Kanara); September 1907 (Khandala); October 1908 (Castle Rock); November 1902 (Belgaum).

Distribution: Mysore, Shimoga, 2,000-3,000 ft.

7. **Impatiens diversifolia** Wall. Cat. 4749; Hook. f. Fl. Brit. Ind. i (1874) 446; Rec. Bot. Surv. Ind. iv (1906) 46.—*I. arnottiana* Miq. in. Herb. Hohenack. 275.

Description: Diffuse with ascending branches, quite glabrous. Stems very succulent, 30 cm. or more long, rooting at the nodes. Leaves all opposite, 12 mm.-7.5 cm., faintly serrate, lower shortly petioled, elliptic or oblong-obtuse, upper sessile, linear-oblong or ligulate, base cordate, all very flaccid when dry; stipules obscure, glandular. Pedicels solitary or twin, with a faint line of pubescence, usually longer than the leaf, deflexed in fruit. Flowers 18 mm.

diam., rose, rotate. Sepals linear-acuminate; standard small, wings broadly semiobovate; spur filiform, ascending, sometimes thick, inflated, equalling or exceeding the flower. Capsule 8 mm., ellipsoid, turgid. Seeds globose, dark brown, smooth, shining.

Locality: Konkan (ex Hook. f.).

Distribution: W. Ghats, from S. Kanara to Travancore, Nilgiris up to 6,000 ft.

8. ***Impatiens Kleinii*** Wight & Arn. Prodr. (1834) 140; Wight Ic. t. 884; Hook. f. Fl. Brit. Ind. i, 445; Kew Bull. (1910) 293; Cke. i, 171.—*Balsamina minor* DC. Prodr. i, 686.—Rheede Hort. Mal. ix, t. 50, 51.

Description: Cke. i, 171.—Hook. f. (Kew Bull. 1910, 293) examined a number of specimens collected by Meebold in the Bombay and Madras Presidencies, which present great variety of habit and foliage, but singular agreement in floral organs and fruit. He gives the following notes on the species: In small specimens the stems are 1.5-2 dm. long or high, erect or diffusely branched, in larger they exceed 3 dm. The leaves are sessile or very shortly petioled, quite glabrous, 2-8 cm. long, orbicular, ovate, elliptic, oblong or linear, nearly quite entire, acute or obtuse, base rounded or contracted, very rarely cordate, the upper ones biglandular at the base. The pedicels are 1-2 cm. long, always glabrous, solitary or binate, lengthening in fruit but rarely equalling the leaves. The minute flowers are white or pale pink or violet-purple, rarely pilose. The linear, acute or subacute sepals vary in breadth and are 1-3-nerved. The small, hooded, apiculate, green standard is dorsally keeled. The obovate or rounded distal lobe of the wings is stipitate for about its own length with no trace of a basal lobe or dorsal auricle on the stipes. The slender spur of the lip is usually about twice the length of the limb, and usually strongly incurved. The filaments are very slender, nearly equal in length, and the minute anthers nearly erect. The ripe capsules are 1-1.5 cm. long, linear or turgidly ovoid, straight, shortly stipitate, acutely beaked, few-seeded; seeds orbicular, compressed, 2-5 mm. diam., black, shining.

Locality: W. Ghats: Lonavla, 2,000 ft. (Meebold 8910, Blatter !); Castle Rock, 2,000 ft. (Meebold 10714-17).—Konkan (Stocks): Miradonger (Dalzell).—N. Kanara: (Hallberg); Sampkhand (Woodrow).

Flowers: September 1907 (Lonavla); October 1908 (Castle Rock, Talguppa, Gersoppa Falls); November 1908 (Shukravarsanti).

Distribution: Madras Presidency: W. Coast and Ghats, in most districts, from sea-level up to 6,000 ft.

9. ***Impatiens kleiniformis*** Sedgwick in Rec. Bot. Surv. Ind. vi (1919) 351.

Description: An erect herb, branching, flaccid, up to 25 cm. high, similar in habit to *I. Kleinii*. Leaves opposite, largest in the middle of the stem, up to 9 cm. long and 2.5 cm. broad, elliptic or oblong, towards the apex getting smaller, crenate and subulate in the crenatures, the uppermost sessile and cordate at the base, the lowest leaves attenuate into a 1 cm. long petiole, glabrous or on the midrib and nerves below sparingly and inconspicuously hirsute, always eglandular and exstipulate. Peduncles axillary, solitary or 2-3-fascicled, during flowering time erect, later on deflexed, very slender, up to 2 cm. long, provided with 2 opposite lines of pubescence. Flowers up to 6 mm. broad, rose, but on the inner side of each wing provided with a longitudinal purple line. Dorsal petal slightly hirsute-keeled and gibbous at the base. Wing with long claws, entire and without auricles. Spur up to 9 mm. long, filiform, subacute. Capsule (not quite ripe) up to 1.5 mm. long, fusiform. Seeds black, glabrous, polished.

Nearly allied to *I. Kleinii*, but can be distinguished by the lines of pubescence on the pedicels, the sessile upper leaves with cordate base, and the absence of glands. It is slightly larger and the flowers are smaller for the size of the plant, paler pink, but with two darker lines on the wings. 'In connection with the glands at the base of *I. Kleinii*,' Sedgwick observes, 'it has been assumed that those glands are metamorphosed stipules; but they are marginal on the leaf base, and often more than one on each side of the leaf. They seem more properly to represent a glandular development of the basal and supra-basal serratures of the leaf-margin.'

Locality: W. Ghats: Castle Rock, about 1,600 ft., rainfall about 250 inches, in ditches by the railway lines and wet places near it (Sedgwick !).

Flowers: August 1917.

See: L. J. Sedgwick: Herbaceous monsoon flora at Castle Rock and a new species of Balsam. In Journ. Bomb. Nat. Hist. Soc. XXV (1918) 482.

10. **Impatiens pusilla** Heyne *ex* Wall. Cat. n. 4745; Hook. f. & Th. in Journ. Linn. Soc. ser. IV (1860) 122; Hook. f. in Kew Bull. (1910) 293; Gamble Fl. Madras 140.—*I. inconspicua* Benth. in Wall. Cat. n. 4,741; Wight & Arn. Prodr. 139; Wight Ic. t. 970; Dalz. & Gibs. Bomb. Fl. 43; Hook. f. Fl. Brit. Ind. I, 447, *et in* Rec. Bot. Surv. Ind. iv (1906) 41, 46; Cke, I, 171.—*I. inconspicua*, var. 2. *pusilla*, var. 3. *filiformis*, var. 4. *ramosissima* Hook. f. Fl. Brit. Ind. I, 448; Cke. I, 172.—*I. oppositifolia* Herb. Wight *ex* Wall. Cat. n. 4743B (*non* Linn.).—*I. filiformis* Wight & Arn. Prodr. 140.—*I. ramosissima* Dalz. in Hook. Kew. Journ. Bot. iii (1851) 230—*I. rosmarinifolia* Wight Ic. t. 750 (*non* Retz.).—*I. Perrottetti* Turz. in Bull. Soc. Nat. Mosc. xxxvi (1863) 594; Hook. f. in Hook. Ic. Pl. t. 2909.

Description: Cke. i, 171.—According to Cooke the flowers are pink. Gamble calls them white streaked with lilac.

'*I. pusilla* is as variable and common a species in the Western Ghats as *I. oppositifolia* and *I. Kleinii*, from which it may be distinguished by the cymbiform spurless or almost spurless lip.' (Hook. f.)

Locality: Konkan: Abundant on many hills (Law, Stocks).—*W. Ghats*: Khandala (Graham); Shirgaon Ghat (Fernandez !); Mahableshwar (Hallberg !).—Common throughout the Presidency.

Flowers: August 1928 (Shirgaon Ghat); August-October (*ex* Cke.).

Distribution: Madras Presidency: W. Ghats, in all districts, 3,000-8,000 ft., very common.

11. **Impatiens Lawii** Hook. f. & Th. in Journ. Linn. Soc. iv (1860) 122; Hook. f. Fl. Brit. Ind. i, 448; Dalz. & Gibs. Bomb. Fl. 43; Cke, i, 172.

Description: Cke. 1.c.

Locality: Konkan (Dalzell & Gibson, Law).—*W. Ghats*: Castle Rock (Woodrow !).—*N. Kanara* (*ex* Hook. f.).

Distribution: Bababudan Hills of Malabar.

12. **Impatiens oppositifolia** Linn. Sp. Pl. (1753) 937; Graham Cat. 34; Wight & Arn. Prodr. 139; Wight Ic. t. 883; Hook. f. Fl. Brit. Ind. i, 448; Cke. i, 172.—*I. rosmarinifolia* Retz. Obs. v, 29 (*non* Wight).—*Balsaminifolia rosmarinifolia* DC. Prodr. i, 686.

Locality: Konkan: (Stocks, Dalzell); Vengurla (Dalzell); Wadi to Paladpur (Woodrow).—*W. Ghats*: Lonavla (Hallberg !); Palghat (Dalzell); hills N. of Belgaum (Ritchie 120).—*N. Kanara*: Tinai (Talbot); Halyal (Talbot).

Distribution: Madras Presidency: W. Ghats, in all districts, common at 3,000-5,000 ft., Ceylon, Burma.

13. **Impatiens tomentosa** Heyne in Wall. Cat. (1828) n. 4751; Dalz. & Gibs. Bomb. Fl. 43 (*excl. syn. I. ramosissima*); Wight Ic. t. 749; Hook. f. Fl. Brit. Ind. i, 449; Cke. i, 173; Gamble Fl. Madras 141.—*I. rufescens* Benth. in Wall. Cat. (1828) n. 4747; Wight Ic. t. 969.

Description: Cke. i, 173.—Flowers pink.

Locality: Konkan (*ex* Hook. f.).—*W. Ghats*: Phunda Ghat (Dalzell & Gibson).

Distribution: Madras Presidency: Nilgiris to Travancore, in boggy places, 5,000-8,000 ft.

14. **Impatiens Dalzellii** Hook. f. & Th. in Journ. Linn. Soc. iv (1860) 123; Dalz. & Gibs. Bomb. Fl. 43; Hook. f. Fl. Brit. Ind. i, 449; Cke. i, 173.

Description: Cke. i, 173.—I have examined many specimens and am, therefore, able to give a more detailed description, at the same time correcting a number of inaccuracies.

Height 10 cm. to 1.2 m. Tap-root white, but not always present, fibrous roots arising chiefly at the base of stem; lower part of stem producing many adventitious roots which are red where exposed. Stem fleshy, succulent, striate (speckled red in longitudinal rows). Internodes up to 13 cm. long. Leaves oblong-lanceolate, up to 15 cm. by 5 cm., upper leaves in our specimens not linear and no long cilia to basal serratures of leaves, quite glabrous, cordate or subcordate or acute at base, veins depressed above, prominent below. Petioles of lower leaves, up to 4 mm. Flowers up to 9 mm. across. Bracts 2, ovate-acuminate, lower half fleshy, upper half scarious. Peduncles up to 2.5 cm.,



Impatiens balsamina Linn. in pure association.



A formation of *Impatiens pulcherrima* Dalz.

Photos by C. McCann.

pedicels up to 4 cm. long; fascicles up to 6-flowered. Usually 1 or 2 flowers open at the same time. Pedicels deflexed in fruit at an angle of 45-80° to the stem. Sepals 6 mm. long, 1.5 mm. broad, with a very broad keeled midrib, hard, with a brown spine. Standard broadly orbicular, irregularly crenulate or entire, yellow, 6 by 8 mm., with a high green irregularly cut crest which ends above into a brown-black spine, spine sometimes with a white band. Wings: A $\frac{1}{2}$ obovate lateral lobe, 6 mm. long, 4 mm. broad, finely apiculate, terminal lobe at or almost at a right angle to the lateral one, obliquely ovate (not obovate), as long and broad, as the lateral one; terminal lobes of wings usually overlapping, sometimes spreading, leaving a deep sinus between them; claw about 1 mm. long. Lip broadly boat-shaped, 9 mm. long, 4 mm. broad, acuminate, spinous-tipped, transversely marked with red-brown streaks or U-shaped markings at the bottom of the boat and a spot of the same colour at the bottom towards the apex, also 3-5 darker longitudinal lines in the roof of the spur, passing to where the spur bends; all the markings, except the spot, also visible outside. Spur about 3 mm. long, subacute or bluntish. Ovary oblong, 5-celled, 5-lobed, slightly bent near apex. Capsules (still green) 15 mm. long, 8 mm. broad, deeply 5-lobed, thick in the middle, getting thinner at both ends, backs of lobes rounded. Seeds up to 5, large, oblong, curved, 3.4 by 2.5-3 mm., smooth, shining, obliquely truncate at base, rounded at apex, flattened on one length-side, rounded on the opposite side, black.

The flowers are very caducous, coming out at the beginning of July and flowering up to November.

Cooke says that the pedicels are not, or rarely, deflexed in fruit. I nearly always found them deflexed. If, in isolated cases, they are not deflexed, it is because they find a mechanical resistance in the leaves. These are sometimes firmly pressed down by the pedicels if the latter don't find the right turn between the opposite leaves.

Usually growing in loose soil and can, therefore, easily be removed from the ground.

Locality: Konkan: Hills (Dalzell, Stocks).—*W. Ghats*: Purandhar (Woodrow); Mahableshwar (Cooke, Blatter !); Panchgani (Hallberg !, Blatter !, McCann !), very common.

Distribution: Endemic.

15. ***Impatiens latifolia*** Linn. Sp. Pl. (1753) 937; Graham Cat. 34; Dalz. & Gibs. Bomb. Fl. 44; Hook. f. Fl. Brit. Ind. i, 450 (*excl. syn. I. cuspidata* Wight & Arn.); Cke. i, 174.—*I. bababudenensis* Hook. f. in Kew Bull. (1910) 295 (*probabiliter sec. Gamble*).—*Balsamina latifolia* DC. Prodr. i, 686.—Rheede Hort. Mal. ix, t. 48.

Description: Cke. l.c.

Locality: Common on the Konkan hills.

Distribution: Madras Presidency: S. Kanara to the Pulney Hills, up to 8,000 ft.

16. ***Impatiens lucida*** Heyne in Wall. Cat. (1828) n. 4738; Hook. f. Fl. Brit. Ind. i, 451 (*excl. syn. I. latifolia* Wight & Arn.); Cke. i, 174.

Description: Cke. l.c.

Locality: Konkan: (Stocks).

Distribution: Madras Presidency: From S. Kanara to Travancore, up to 4,000 ft.

17. ***Impatiens balsamina*** Linn. Sp. Pl. (1753) 938; Hook. f. Fl. Brit. Ind. i, 453; Cke. i, 174; Gamble Fl. Madras 142.

This species occurs all over India, Ceylon, China and Malaya. As to its varieties Hook. f. wrote to Gamble in 1904: 'I am having an awful time over the varieties of *I. balsamina*, which are legion and strangely diverse. . . . I have no faith in a single character of any one form; most of these being taken from single specimens. As, however, I indicate the locality of each form, future collectors may be led to investigate them in their homes.—I have written asking Talbot for the loan of his Balsams (of the Deccan), a suicidal proceeding, for if he has collected *I. balsamina* with care, his specimen will be sure to upset my beloved varieties.'

As the Peninsula forms of this species present such great differences, Hook. f. attempted in an appendix to his Epitome i (Rec. Bot. Surv. Ind. iv, 49) to discriminate the most remarkable of them. It is from this appendix that we adopt the key for the chief varieties found in the Bombay Presidency.

- I. Leaves usually crowded, 7-20 cm. long
1. Leaves lanceolate or oblanceolate; flowers subsolitary, spur of lip much longer than limb a. *var. vulgaris* proper.
 2. Leaves linear-lanceolate, pedicels 2-3-nate, flowers rather large, spur of lip shorter than the limb, strongly incurved b. *var. rosea*.
- II. Leaves very small, 2.5-5 cm. long, pedicels solitary or binate, short. Stem stout, much branched, leafy, leaves small, subsessile, ovate-obtuse, thick, flowers small, sepals very minute, obtuse, standard orbicular, spur of lip stout, incurved c. *var. agrestis*.

a. **Var. vulgaris** proper Hook. f. Fl. Brit. Ind. I, 454.—*I. balsamina* Dalz. & Gibs. Bom. Fl. 44; Graham Cat. 34.—*I. cornuta* Linn. Sp. Pl. (1753) 937.—*I. coccinea* Sims.

Locality: This is the common form in the Presidency. Widely distributed in the Konkan, the W. Ghats and the Deccan.

Distribution: Widely distributed in tropical E. Asia.

b. **Var. rosea** Hook. f. Fl. Brit. Ind. I, 454.—*I. rosea* Lindl. Bot. Reg. (1841) t. 27.—*I. balsamina var. brevicarata* T. Cooke Fl. Bomb. I, 174.

Locality: W. Ghats: Mahableshwar (Cooke !, Hallberg !); Panchgani (Hallberg).

Distribution: Godavari District at Samalcotta, W. Himalaya.

c. **Var. agrestis** Hook. f. in Rec. Bot. Surv. Ind. IV (1906) 50.

Locality: Abundant, colouring ploughed fields in the Satara district; eaten by animals (*ex* Hook. f.).

Colour variations.

a. Rose. Terminal wing-lobes with very distinct white longitudinal markings, sharpest below where the end is yellow and disappears before reaching the margin. Limb of lip pale along the midlobe, with a lineated yellow spot about half way down. Tip of spur pale green. Stem reddish; pedicels darker; glands almost black.

Locality: Bombay Island. Common during the rains.

b. Almost white. Lip delicately pink, white inside, with a lineated yellow spot. Standard with a pinkish central part. Lateral wing-lobes very faintly pink.

Locality: Sewri (Bombay Island); Versova (Salsette).

Flowered in September.

c. Like a; but flowers much smaller, especially midlobe of wings which has a broad pale green margin or is entirely pale green. Much of standard and lip green.

Locality: Sewri (Bombay Island) rare.

Flowered in September.

18. **Impatiens scabriuscula** Heyne in Roxb. Fl. Ind. (ed. Carey) II (1824) 464; Dalz. & Gibs. Bomb. Fl. 44; Bedd. Ic. Pl. Ind. Or. 29, t. 144; Cke. I, 174.

Description: Cke. l.c.

Locality: Konkan, apparently rare.

Distribution: Madras Presidency: From S. Kanara and Coorg to the Wynaad and Nilgiris, up to 6,000 ft.

19. **Impatiens pulcherrima** Dalz. in Hook. Kew Journ. Bot. II (1850) 37; Hook. Bot. Mag. (1851) t. 4615; Dalz. & Gibs. Bomb. Fl. 41; Hook. f. Fl. Brit. Ind. I, 458; Cke. I, 175; Gamble Fl. Madras 143.

Description: Cke. l.c.

Locality: Konkan (Dalzell & Gibson, Woodrow).—W. Ghats: Fitzgerald Ghat (McCann !, Blatter !).—S.M. Country: Londa (Woodrow, Hallberg !).

Flowers: Aug. 1930 and Nov. 1929 (Fitzgerald Ghat).

Distribution: Mysore.

20. **Impatiens Talboti** Hook. f. in Rec. Bot. Surv. Ind. IV (1906) 47.

Description from Hook. f.'s MS. kindly supplied by C. E. C. Fischer of the Kew Herbarium.

An annual herb, 2-3 dm. high, glabrous or branchlets and leaves pubescent. Stem simple, suddenly erect from the base, nude for a long distance, few-leaved towards the apex. Leaves 6-10 cm. long, alternate, long-petiolate, broadly or elliptic-ovate or -oblong, acuminate at both ends, remotely subseriate, membranous, ciliate towards the base, narrowed into a slender 1-3 cm. long naked or glandular petiole; nerves 6-8 pairs; stipular glands 0. Pedicels solitary, short, 1-2 cm. long, in fruit elongate, straight or decurved. Flowers 2-2.5 cm. when expanded. Sepals 2, minute, 2-6 mm. long, subulate or deltoid-ovate. Vexillum orbicular, concave, 6-10 mm. diam., below the apex on the back spurred, cuspidate. Wings sessile, 1-2 cm. long; lobes broadly obovate, basal one ample, subquadrate, bilobulate, dorsal auricle prominent. Limb of labellum short, 10 mm. long, saccate, cymbiform, at the mouth ascending acuminate; spur slender, 2-3 cm. long, straight, pendulous, acute, incurved when young. Filaments subulate; anthers didymous. Ovary ovoid, attenuate into a short style; stigmata subulate. Capsules small, almost globose, 5-8 mm. diam., scarcely stipitate, obscurely rostrate, few-seeded. Seeds subglobose, 3-4 mm. diam., compressed, glabrous, tuberculate, brown.

A near ally of *I. pulcherrima* and *dasysperma* distinguished from the former by its small stature, leaves and flowers, from the latter by the form and serration of the leaves and the smaller capsule. It inhabits a very much lower level than either of the above.

Locality: N. Kanara: (Law); Devimane Ghat, 2,600 ft. (W. A. Talbot 3722); Castle Rock, 2,000 ft. (Meebold 6960).

RUTACEAE (Cke. I, 175).

Genera 100, species 800.—Tropical and temperate, especially S. Africa and Australia.

1. RUTA (Tourn.) Linn. (Cke. I, 176).

Species 50.—Chiefly Mediterranean, W. and Central Asian. As in Cke.

2. EVODIA Frost. (Cke. I, 177).

Species 45.—Tropics, except America.

1. **Evodia roxburghiana** Benth. Fl. Hongk. (1861) 59 (*partim*); Hook. f. Fl. Brit. Ind. I, 487 (*partim*); Brandis Ind. Trees 112 (*partim*); Cke. I, 177 (*partim*).—*E. malayana* Ridl. Fl. Malay Penins. I (1922) 342.—*Zanthoxylum Roxburghianum* Cham. in Linnaea (1830) 58, *in nota*.—*Fagaria triphylla* Fl. Ind. ed. Carey I (1820) 436.

Locality: Cke. I, 178.

Distribution: Bombay Presidency; Madras Presidency: W. Ghats, from Mysore to Tinnevely, up to 7,000 ft., in evergreen and secondary forests, E. Ghats; Ceylon, Sumatra, Java.

3. ZANTHOXYLUM Linn. (Cke. I, 178).

Species 80.—Tropical and warm regions of the world.

Cke. describes 2 species, *Z. ovalifolium* and *Z. Rhetsa*. As to the latter I follow Haines in combining it with *Z. Budrunga*.

1. **Zanthoxylum ovalifolium** Wight Ill. I (1840) 169.

Locality: N. Kanara: Rain forests of the Sirsi and Siddhapur sub-divisions (*ex* Talbot).

Flowers: Feb.-March (Talbot); Nov. and Dec. (Cooke).

Fruit: Ripens in the cold season.

Distribution: W. Ghats of Madras Presidency: From S. Kanara to Tinnevely; up to 4,000 ft.

2. **Zanthoxylum Budrunga** Wall. Cat. 1221; Hook. f. Fl. Brit. Ind. I, 495.—*Fagaria Budrunga* Roxb. Fl. Ind. I (1832) 417.—*Z. Rhetsa* DC. Prodr. I (1824) 728; Wight & Arn. Prodr. 148; Graham Cat. 36; Dalz. & Gibs. Bomb. Fl. 45; Hook. f. Fl. Brit. Ind. I, 495; Cke. I, 178.—*Fagaria Rhetsa* Roxb. Fl. Ind. I (1832) 417.

Description. A small or moderate sized tree with pale corky bark, covered with conical prickles on stems and branches and sometimes a few small ones on the leaf rhachis. Leaves clustered towards the ends of the stout branchlets, 45-60 cm. long (with the petiole). Leaflets 19-25 or fewer, somewhat like those of a Toon, 7.5-15 cm. long, oblong or lanceolate, caudate, entire or crenate, when crenate with a large gland in the sinus. Flowers 4.3 mm. diam., yellow, 4-merous, in large terminal panicles with opposite branches.

Haines justifies his combination by the following remark: I think it is impossible to separate *Z. budrunga* and *Z. rhetsa*. The former is usually the North India form, the latter usually the Peninsula form, and, as might be expected, the Bihar and Orissa plant unites the two, that from Bishanpur being more nearly *Z. budrunga* and that from Puri more nearly *Z. rhetsa*, but even in the latter some leaflets are crenate. Again, some Sikkim and Chittagong specimens occur with entire leaves and several have been doubtfully named in the Calcutta Herbarium. Moreover, the characters used by Roxburgh to discriminate the two species are not the leaf crenatures, and both his descriptions and figures show the leaves of both species quite entire! He evidently knew his '*Fagara Rhetsa*' well, but seems to have had a specimen of *F. budrunga* with very few leaflets.

Locality: Khandesh, Konkan, W. Ghats, N. Kanara.

Distribution: Madras Presidency: W. Ghats in S. Kanara, Mysore, Malabar, Anamalais and Travancore at low elevations, E. Ghats. Tropical Himalaya, Sylhet, Khasia Mts., Chittagong, Martaban.

4. TODDALIA Juss. (Cke. I, 179).

Species 1.—Tropical Asia, Africa, Madagascar.

Cke. calls one species *T. aculeata* Pers. It has to cede to *T. asiatica* Lam. The other species *T. bilocularis* has to go under *Vepris*.

1. **Toddalia asiatica** Lam. Ill. II (1793) 116; Gamble Fl. Madras 150; Haines Bot. Bih. & Or. 160.—*T. aculeata* Pers. Syn. I (1805) 249; Graham Cat. 37; Dalz. & Gibs. Bomb. Fl. 46; Wight III. t. 66; Engl. in Engl. & Prantl-Pflanzenf., III, 4, 176 fig. 101 A-K; Hook. f. Fl. Brit. Ind. I. 497; Cke. I, 179.—*I. floribunda* Wall. Pl. As. Rar. III, 37.—*Scopolia aculeata* Sm. Ic. ined. sub. t. 34; Roxb. Fl. Ind. I (1832) 616.—*Limonia oligandra* Dalz. in Kew Journ. Bot. II (1850) 258; Dalz. & Gibs. l.c. 28.—*Paullinia asiatica* Linn. Sp. Pl. (1753) 365.

Description: Cke. I, 179.

Locality: Konkan, W. Ghats, N. Kanara.

Distribution: Throughout the W. Peninsula, Ceylon, subtropical Himalaya, from Kumaon to Bhutan up to 5,000 ft., Khasia Mts., up to 6,000 ft., Sumatra, Java, China, Philippines.

5. VEPRIS Comm. ex A. Juss in Mem. Mus. Par. 12 (1825) 509.

Trees or shrubs, unarmed. Leaves alternate, 1-3-foliolate, the leaflets usually petiolulate, gland-dotted. Flowers small, in terminal or axillary panicles. Calyx small, saucer-shaped, 2- or more-lobed. Petals 2-4, lanceolate or ovate, more or less imbricate. Stamens in male flowers twice or three times as many as the petals, inserted under the disk, filaments slender; anthers ovate; in female flowers reduced to minute staminodes with small rudimentary anthers. Ovary in male flowers small, ovoid, 2-cleft at apex; in female flowers globose 2-4-celled; styles 0; stigma capitate; ovules in each cell 2, collateral. Fruit globose or oblong, 2-4-celled, fleshy. Seeds one in each cell, flattened, oblong, testa crustaceous; albumen fleshy; embryo flat, cotyledons thick, ovate; radicle stout.

Species about 16.—Africa, Mascarene Islands, India.

1. **Vepris bilocularis** Engl. in Engl. & Prantl Pflanzenf. III, 4 (1896) 178.—*Toddalia bilocularis* Wight & Arn. Prodr. (1834) 149; Dalz. & Gibs. Bomb. Fl. 46; Bedd. For. Man. in Fl. Sylv. p. XLIII et Ic. t. 167; Hook. f. Fl. Brit. Ind. I, 497; Cke. I, 180.—*Dipetalum biloculare* Dalz. in Kew Journ. Bot. II (1850) 38.

Description: Cke. I, 180.

Locality: Very rare in the Presidency. Found only once in N. Kanara by Dalzell.

Distribution: Madras Presidency: Forests of Malabar, Anamalais and Travancore up to 4,000 ft.

6. ACRONYCHIA Forst. (Cke. I, 180).

Species 20.—Tropical Asia and Australia.

1. **Acronychia laurifolia** Blume Cat. Gew. Buitenz. (1823) 63; Cke. I, 180.

Locality: Konkan, N. Kanara.

Distribution: Madras Presidency: N. Circars, S. Deccan slopes in Salem; W. Ghats in hill forests up to 6,000 ft.; Sikkim Himalaya, Khasia Mts., Assam, Chittagong, Malay Peninsula, Sumatra, Java, Cochin-China.

7. GLYCOSMIS Corr. (Cke. I, 181).

Species 6.—Indo-Malayan.

By some *G. arborea* DC. and *G. pentaphylla* Corr. are kept separate (see Haines Bot. Bih. & Or. 163). Hook. f. united them under *G. pentaphylla* Corr. (Fl. Brit. Ind. I, 499) and Cooke followed him. Gamble, however, put them under *G. cochinchinensis* Pierre (Fl. Madras 153).

There are too many intermediates between the two species to justify their being kept separate, though Haines finds them easily distinguished in his area. If it is a question of choosing *G. pentaphylla* or *cochinchinensis* the following list of synonyms will show that the specific name *pentaphylla* is older than *cochinchinensis*.

1. **Glycosmis pentaphylla** Corr. in Ann. Mus. Hist. Nat. VI (1805) 386; Graham Cat. 23; Dalz. & Gibs. Bomb. Fl. 29; Bedd. Fl. Sylv. Anal. Gen. XLIII, t. 6, f. 6; Hook. f. Fl. Brit. Ind. I, 500; Cke. I, 181.—*Limonia pentaphylla* Retz. Obs. V (1789) 24; Roxb. Corom. Pl. I, t. 84.—*Toluiifera cochinchinensis* Lour. Fl. Cochinchinensis (1790) 262.—*Glycosmis arborea* DC. Prodr. I, 538.—*Limonia arborea* Roxb. Corom. Pl. t. 85; Fl. Ind. II (1832) 381.—*Mynospermum chylocarpum* Roem. Syn. fasc. I, 40.—*G. chylocarpa* Wight & Arn. Prodr. 93.—*G. triphylla* Wight Ic. t. 167.

Description: Cke. I, 181.

Locality: Common in the undergrowth of the monsoon forests of the Konkan, the W. Ghats and N. Kanara, often near streams and water-courses and other moist shady localities near villages.

Flowers: Throughout the year.

Distribution: In all districts of the Madras Presidency, Ceylon, tropical and subtropical Himalaya, up to 7,000 ft., Upper Assam, Malay Peninsula, Malaya, China, Borneo, Australia.

8. MURRAYA Koen. *ex* Linn. (Cke. I, 181).

Species 5.—Indo-Malayan.

Cke. gives 2 species; of these *M. exotica* must be called *M. paniculata*.

1. **Murraya paniculata** Jack in Mal. Misc. I, no. 5 (1820) 31; Dalz. & Gibs. Bomb. Fl. 29.—*Chalcas paniculata* Linn. Mant. I (1767) 68.—*M. exotica* Linn. Mant. II (1771) 563 (*Murræa*); Graham Cat. 24; Wight Ic. t. 196; Bedd. For. Man. in Fl. Sylv. p. XLIV *et* Anal. Gen. t. 7, f. 2; Hook. f. Fl. Brit. Ind. I, 502; Cke. I, 182; Gamble Fl. Madras 155.

Murraya Koen. according to the Brussels Congress is a retained name. *Camunium* Adans. (1763). *Chalcas* L. (1767), and *Bergera* Koenig (1771) are older.

See Tyozaburo Tanaka, *Chaclas*, a Linnaean genus which includes many new types of Asiatic types. In Journ. of the Society of Tropical Agriculture, Taiwan, Japan I (1929) 23-42.

Tanaka gives the following synonyms of his *Chaleas paniculata* L., (see l.c. 25):—*Murraya paniculata* Jack, Mal. Misc. i, no. 5 (1820) 31.—*M. exotica* Linn. Mant. pl. altera (1771) 563.—*Camunium exoticum* O. Kze. Rev. Gen. Pl. i (1881) 99.—*Chalcas exotica* Millsp. in Field Col. Mus. publ. iv (Bot. ser. i, no. 1) (1895) 25.—*Murraya sumatrana* Roxb. Hort. Beng. (1814) 32.—*M. exotica var sumatrana* Koord. *et* Valet. Bijdr. Booms. Jav. (1896) 4243.—*Chalcas sumatrana* Roem Syn. mon. (1846) 49.—*Murraya elongata* S. DC. *ex* Hook. f. Fl. Brit. Ind. i (1872) 503.—*M. banati* Elmer Leaflets Ph. bot. viii

(1915) 2812.—*M. heptaphylla* Spanog. in *Linnaea* xv (1841) 178.—*M. tavoyana* A. DC. ex Wall. in sched.—*M. chinensis* Pavon in sched.

Distribution: Throughout the hotter parts of India, Ceylon, China, Australia and the Pacific Islands.

2. **Murraya Koenigii** Spreng. Syst. Veg. ii (1825) 315; Cke. i, 182.

Locality: *Konkan*: Bombay Island (Blatter !); Salsette (Blatter !).—*W. Ghats*: Khandala (McCann !); hills near Poona (Woodrow !); Pasarni Ghat (Blatter !); Panchgani, common on slopes of Tablelands (Blatter !); Mahableshwar (Cooke, McCann !); W. of Belgaum (Ritchie).—*N. Kanara*: Supa district (Talbot).

Distribution: Madras Presidency: In most districts, chiefly in the N. Circars and Deccan, less frequent on the W. Coast; along the foot of the Himalaya, from Garhwal to Sikkim, up to 5,000 ft., Bengal, Pegu, S.-E. Asia. Often cultivated.

9. CLAUSENA Burm. f. (Cke. I, 183).

Species 20.—Palæotropics.

1. **Clausena indica** Oliv. in Journ. Linn. Soc. v (1861) Suppl. ii, p. 36; Cke. i, 183.

Description and Locality: Cke. l.c.

Distribution: Madras Presidency: W. Ghats, in evergreen forests of the Anamalais and Travancore, at 3,000-5,000 ft.; Ceylon.

2. **Clausena Wildenowii** Wight & Arn. Prodr. (1834) 96; Dalz. & Gibs. Bomb. Fl. 30; Wight Ic. t. 14; Bedd. For. Man. in Fl. Sylv. p. xlv, et Anal. Gen. t. 7, f. 3; Hook, f. Fl. Brit. Ind. i, 506; Cke. i, 183.—*C. pubescens* Wight & Arn. Prodr. 96.—*Cookia dulcis* Bedd. in Madras Journ. 1861; Trans. Linn. Soc. xxv, 211.

Description and Locality: Cke. i, 183.

Distribution: Madras Presidency: Carnatic, Salem, W. Ghats from Mysore through the Nilgiris to Travancore at low levels.

*3. **Clausena Wampi** Blanco.—*Cookia punctata* Sonner. Voy. Ind. iii, 258, t. 130.

Locality: Grown in gardens.

Distribution: A native of China (Chinese name Wampi).

10. TRIPHASIA Lour. (Cke. I, 184).

Species 1.—Tropics.

Cke. calls it *T. Aurantiola* Lour. The specific name *trifolia* is older.

1. **Triphasia trifolia** P. Wils. in *Torreyia* ix (1909) 33.—*Limonia trifolia* Burm. f. Fl. Ind. (1768) 103, t. 35, f. 1.—*Limonia trifoliata* Linn. Mant. ii (1771) 237; DC. Prodr. i (1824) 536; Graham Cat. 23; Dalz. & Gibs. Bomb. Fl. Suppl. 12; Hook. f. Fl. Brit. Ind. i, 507.—*T. Aurantiola* Lour. Fl. Cochinch. i (1790) 153.

Distribution: Probably a native of China. Cultivated and run wild in many parts of the tropics.

11. LIMONIA Linn. (Cke. I, 184).

Species 10.—Tropical Africa and Asia.

Cke. calls the only Bombay species *L. acidissima*. It must cede to *L. crenulata*.

1. **Limonia crenulata** Roxb. Corom. Pl. i, t. 86; Fl. Ind. ii (1832) 381; Gamble Fl. Madras 157.—*L. acidissima* Wight & Arn. Prodr. (*non* Linn.); Graham Cat. 23 (*non* Linn.); Dalz. & Gibs. Bomb. Fl. 29 (*non* Linn.); Hook. f. Fl. Brit. Ind. i, 507 (*non* Linn.); Cke. i, 185 (*non* Linn.).—*Hesperethusa crenulata* Roem. Syn. fasc. i, 38.—Rheede Hort. Mal. iv, t. 14.

Gamble gives the following explanation of the above changes: '*L. crenulata* Roxb. Corom. Pl. i, t. 86 is the name which, as explained by Trimen in Journ. Linn. Soc. xxiv, 142, must be adopted for the plants recorded in the Flora Brit. Ind. under the name *L. acidissima* Linn., the actual specimens in Hermann's Herbarium, which are in leaf only, showing that they belong to *Feronia Elephantum*.' [Kew Bull. (1918) 223].

Locality: S.M. Country: Common in the Belgaum district: Gokak Falls (Dalz. & Gibs.); Padshapur hills (Graham).

Distribution: Bengal, Assam, W. and S. India (N. Circars, Deccan and Carnatic), Burma, Yunnan, Siam, Cambodia, Laos.

12. LUVUNGA Ham. (Cke. I, 185).

Species 4.—Indo-Malayan.

1. **Luvunga eleutherandra** Dalz. in Kew Journ. Bot. ii (1850) 258; Cke. i, 185.

Distribution: Bombay Presidency: Konkan, Ghats, N. Kanara; Madras Presidency: W. Ghats from S. Kanara and Mysore to Anamalais and Travancore up to 3,000 ft. in evergreen forests; Ceylon; Java.

13. PARAMIGNYA Wight (Cke. I, 186).

Species 6.—Indo-Malayan.

1. **Paramignya monophylla** Wight Ill. i (1840) 109; Cke. i, 186.

Distribution: Bombay Presidency: Konkan, W. Ghats, N. Kanara; Madras Presidency: N. Circars, W. Ghats from S. Kanara to Tinnevely up to 6,000 ft.; Sikkim Himalaya, Bhutan, Khasia Mountains, Tenasserim, Ceylon.

14. ATALANTIA Corr. (Cke. I, 186).

Species 18.—Asia, China, Australia.

Cke. has 4 species. Brandis and Talbot are of opinion that *A. racemosa* is not specifically distinct from *A. monophylla*. Gamble, apparently with good reasons, keeps them separate. We follow Gamble and Cooke. We omit from Cooke *A. missionis* Oliv. He has not seen any plant and mentions only one locality 'ex Talbot'. Talbot, however, in his Forest Flora i (1909) does not mention the species at all.

1. **Atalantia monophylla** Corr.; DC. Prodr. i (1824) 535; Graham Cat. 23; Dalz. & Gibs. Bomb. Fl. 28; Hook. f. Fl. Brit. Ind. i, 511; Gamble Madras Fl. 159; Cke. i, 187.—*A. floribunda* Wight Ic. t. 1611.—*A. puberula* Miq. Ann. Mus. Bot. Ludg. Bot. i (1863-64) 211.—*Limonia monophylla* Linn. Mant. ii (1771) 237; Roxb. Corom. Pl. i, t. 82; Fl. Ind. ii (1832) 378.—*Turraea virens* Hellen. in Act. Holm. (1788) t. 10, f. 1 (*non* Linn.).—Rheede Hort. Mal. iv, t. 12.

Description: Cke. i, 187.

Locality: Konkan: (Dalz. & Gib.); Bombay Island (Blatter !).—*W. Ghats:* Khandala (Blatter !); Belgaum Ghats (*ex* Talbot).—*N. Kanara:* Moist forests (*ex* Talbot).

Distribution: Madras Presidency: N. Circars, Deccan and Carnatic in dry forests, W. Coast and W. Ghats. Foot of the Khasia Mountains, Ceylon, Malay Peninsula, China, Indo-China, Java.

2. **Atalantia racemosa** Wight & Arn. Prodr. (1834) 91; Cke. i, 187.

Distribution: Bombay Presidency: Konkan, W. Ghats; Madras Presidency: Hills of the Deccan, up to 4,000 ft., W. Ghats, chiefly on E. side from Mysore to Travancore, up to 3,000 ft.; Ceylon.

3. **Atalantia ceylanica** Oliv. in Journ. Linn. Soc. v (1861) Suppl. 2, p. 25.

Distribution: Bombay Presidency: Phunda Ghat; Madras Presidency: W. Ghats in Wynaad, Malabar, Nilgiris, Anamalais and Travancore, up to 5,000 ft.; Ceylon.

15. CITRUS Linn. (Cke. I, 188).

Species 10.—Palæotropics and subtropics.

Of the 3 species mentioned by Cooke we retain *C. medica* and *C. Aurantium*, and change *C. decumana* into *C. maxima*.

3. **Citrus maxima** Merrill Interpr. Herb. Amb. (1917) 296.—*Aurantium maximum* Burm. *ex* Rumph. Herb. Amb. Actuarium (1755) Ind. Univ. [16].—*Citrus decumana* Murr. Syst. ed. 13 (1774) 580.

For interesting notes on the species of *Citrus* see:

Brandis.—For. Fl. (1874) 50.

Burns & Paranjpye in Poona Agr. Coll. Mag. May 1913, reproduced in Tropic. Agriculturist 42 (1914) 117.

Bonavia, E.—Cultivated Oranges and Lemons of India and Ceylon. London, 1890.

Chibber, N. M.—Morphology of Spines in Citrus. Proc. 5th. Ind. Science Congress (1918) clxxxiii.

Lushington, A. W.—The genus *Citrus* in Ind. For. xxxvi, 323-353.

Guillaumin, A.—Les travaux récents sur les Aurantiées. Rev. Bot. Applic. Agric. Coloniale 8 (79) (1928) 169-176.

16. FERONIA Corr. (Cke. I, 191).

Species 1.—India to Java.

The name of *F. Elephantum* must be changed into *F. limonia*.

1. **Feronia limonia** (Linn.) Swingle in Journ. Washington Acad. Sc. iv (1914) 325-28.—*F. Elephantum* in Trans. Linn. Soc. v (1800) 225; Roxb. Corom. Pl. t. 141; Fl. Ind. ii (1832) 411; Wight Ic. t. 15; Graham Cat, 24; Dalz. & Gibs. Bomb. Fl. 30; Hook. f. Fl. Brit. Ind. i, 516; Cke. i, 191.

Distribution: Throughout India in dry situations from the Punjab eastwards and southwards to Ceylon; Java.

17. ÆGLE Corr. (Cke. I, 192).

Species 3.—Indo-Malayan.

1. **Ægle Marmelos** Corr. in Trans. Linn. Soc. v (1800) 223; Cke. i, 192.

Distribution: Throughout India, in dry hilly places, from the Jhelum to Assam and southwards to Travancore, wild or cultivated, or run wild, up to 4,000 ft. in the W. Himalaya.

(To be continued.)